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NEW AND NOTEWORTHY *PANDANUS (PANDANACEÆ)* FROM MADAGASCAR COLLECTED BY J.-L. GUILLAUMET AND G. CREMERS

by Benjamin C. STONE[1]

SUMMARY: Recent explorations in Madagascar have revealed the presence of three new species of *Pandanus, P. linguiformis, P. grallatus* and *P. flagellaris,* of which the last two are first described herein; and several new locality records for previously known species. Pistillate specimens of *P. pristis,* a recently described species known hitherto only from staminate collections, have been discovered and are described. Another recently described species, *P. cephalotus,* known hitherto only in cultivation in Mauritius and Ceylon, has been discovered in the wild in Madagascar; the locality data are detailed herein.

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Since 1968 field study and collections of *Pandanus* in Madagascar have added 17 species to its flora, all endemic, bringing the total so far known to 92 species (ST. JOHN, 1968*a*, 1968*b*; STONE, 1970*a*, 1970*b*, 1971*a*, 1971*b*, and STONE & GUILLAUMET, 1970, 1972), which makes the Grand Island stand out as having one of the richest regional pandan-floras of all, rivaled only by New Guinea and Borneo (and the Philippines, if all its islands are considered as one region).

A review of the infrageneric classification of Madagascar *Pandanus* was presented by STONE (1970*a*); and a new comprehensive classification more recently (1974). Since 1970 an additional section has been established (*Rykia* subsect. *Lonchostigma* raised to rank of section) and at least one or two further sections have been recognized, bringing the number of sections of the genus occurring in Madagascar up to 12, of which all but 3 are endemic. The latter are Sect. *Vinsonia,* which occurs in the Mascarene islands, Sect. *Dauphinensia,* which occurs in East Africa, and Sect. *Heterostigma,* which occurs in Africa. (The question of whether or not Sect. *Pandanus* is represented still rests on the possibility of a renewed study, preferably on improved materials, of the puzzling species *P. perrieri* Martelli; however, in all probability, this will turn out to belong to some other section of the subgenus *Vinsonia,* and not to Sect. *Pandanus* of subgenus *Pandanus.* However, two species representing Sect. *Pandanus* occur nearly, one (*P. kirkii* Rendle) in East Africa and the other, *P. maximus* Martelli, in the Comoro Islands).

M. GUILLAUMET has recently sent collections of *Pandanus* from several localities, including the Marojejy Nature Reserve[1], and has forwarded some few collections by the entomologist M. PEYRIERAS. Several are of great interest, particularly the collection which serves as the type of a remarkable new species, *P. linguiformis*[2], which constitutes the basis of a distinct subsection *Monocarpa* of Sect. *Dauphinensia*. For their continuing interest I would like to express my best thanks to M. GUILLAUMET, M. PEYRIERAS, M. G. CREMERS, and to the Director of O.R.S.T.O.M., Tananarive. Specimens referred to in this paper are deposited in KLU, and duplicates in P and TAN.

PANDANUS L. ex Stickm.

Subgenus VINSONIA (Warb.) B. C. Stone
Sect. *ACANTHOSTYLA* Martelli

Pandanus columnaris St. John

SOUTH-EAST: N. of Fort Dauphin, littoral swamp, habit columnar, 2.12.71, *Guillaumet 4006* (fruit).

Pandanus sparganioides Baker

CENTER: Prov. Fianarantsoa, high altitude forest, Dec. 1963, *Bosser 18328*; NORTH-EAST: Marojejy Nature Reserve, 2100 m alt., with bulbil-like branchlets, 27.11.72, *Guillaumet 4061 & 4061-s*.

This species is remarkable for the fact that it does not share the « coniferoid » habit otherwise so characteristic for this Section, as described by STONE (1970c).

Pandanus pseudobathiei Pic.-Ser.

NORTH-EAST: Marojejy Nature Reserve, 1300 m alt., 2.12.72, *Guillaumet 4114* (fruit); May 1972, *A. Peyrieras s.n.*

Pandanus mangokensis Martelli

NORTH-EAST: Marojejy Nature Reserve, 900 m alt., dense forest in a ravine, 9.12.72, *Guillaumet 4197* (fruit).

The styles are normally single on the phalanges in this collection.

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[1] Recherche coopérative au programme 225 du C.N.R.S. « Étude des écosystèmes montagnards de la région malgache ».

[2] cf. STONE, Towards an improved infrageneric classification in *Pandanus* (*Pandanaceæ*) in Bot. Jahrb. Syst. **94** (1974).

Sect. *HETEROSTIGMA* (Gaudich.) B. C. Stone

Pandanus bakeri Warb.

CENTER: Itremo, gallery forest, Jan. 1973, *A. Peyrieras s.n.* (♂ & ♀).

Pandanus cephalotus B.C. Stone

Mauritius Inst. Bull. 7 (1) : 13-16, Pl. 1 (1971).

SOUTH-EAST: Soavala, W. of Manantenina, interior marshes, 1.12.71, *Guillaumet 4000* (fruits).

This species was described from plants cultivated in Mauritius but known to have come from Madagascar. Subsequently (April 1973) it was identified in the collections of the Royal Botanic Gardens, Peradeniya, Ceylon, but it could not be established just when or how it was introduced. The collection cited above is the first to show where this species occurs naturally in Madagascar. GUILLAUMET notes that it is a tree 5-6 m tall, which corresponds well with the type collection from Mauritius. Although the marginal teeth of the leaves are slightly larger the specimens match very well in most other respects, and there seems little reason to doubt that this is therefore the first known record of the wild occurrence of the species.

Sect. *FOULLIOYA* Warb.

Pandanus longecuspidatus Pic.-Ser.

NORTH-EAST: Marojejy Nature Reserve, 600 m alt., 12.12.1972, *Guillaumet 4214* ♂, *4215* ♀.

Pandanus pseudocollinus Pic.-Ser.

SOUTH-EAST: Manantenina, littoral forest on sand, 6.7.71, *Guillaumet 3852* (♀).

Pandanus pygmæus Thouars

SOUTH-EAST: Soavala, Manantenina, in marsh, 1.12.71, *Guillaumet 3996* (fruit).

The drupes in this collection are perfectly ripe and exceed in length the known measurements of drupes of *P. pygmæus*, which may however have been based on immature material. In leaves and stems this collection shows about the same dimensions as in known materials of *P. pygmæus*, and the detailed vegetative characters seem to be alike. In view of this I have identified this as *P. pygmæus* but indicate that it might perhaps be a local variant, or, if the drupes at comparable stages are really larger, even a locally endemic species.

Sect. *SOULEYETIA* (Gaudich.) B. C. Stone

Subsect. *SOULEYETIA*

Pandanus freycinetioides (Gaudich.) Kurz

CENTER-EAST: Forests of Lakato, c. 1000 m alt. 3-4 m tall. July 1973, *Guillaumet 4280* (♀).

Subsect. *SUSSEA* (Warb.) B. C. Stone

BASIONYM: Sect. SUSSEA WARB, *in* ENGL. Pflanzenr. 3 (IV.9): 62 (1900).

TYPE SPECIES: *Pandanus microcarpus* BALF. F., *in* BAKER. See STONE, 1970a.

Pandanus dyckioides Baker

CENTER: W. of Lake Alaotra, on route to Andriamena, 5.2.70, *Guillaumet 2522;* Moramanga, islet of forest 12 km W. of Moramanga, 10.10.71, *Guillaumet 3875.*

Pandanus leptopodus Martelli

CENTER-EAST: Beforono, between Tananarive and Perinet, 4.10.1973, *Cremers 2784* ♀.

Pandanus pristis B.C. Stone (Fig. 1).

NORTH: Forest of Mahory E. of Ankarana, Diego Suarez, 14.8.1973, *Cremers 2467* (fr.).

This species, first described from staminate specimens, now is represented by the cited pistillate collection. The fruit can be described as follows:

Cephalium terminal, solitary, small oblong-ovoid, approx. 7 cm long, 5 cm wide, on a peduncle c. 12 cm. long, 5-6 mm wide, triquetrous, withbracts along its length and more crowded at the apex just under the cephalium, bracts lance-ovate, margins and costa closely serrulate, the serrulations nearer the base very fine and close, pectinate, but distally 1-2 mm apart. Cephalium composed of about 70-75 drupes; drupes cuneate, 5-6-angled, 18-21 mm long, c. 12 mm wide, mostly unilocular, a few bilocular, pileus pyramidal, about 10 mm high, terminating truncately in a round nearly plane stigma, 2-2.6 mm wide, with a minute short groove at the distal (ventral) edge. Endocarp above the center of the drupe, 1-chambered, osseous ferrugineous, nearly reaching the drupe apex above, medially expanded (thus somewhat conic in form), the wall in the thinner part about 2 mm thick, the chamber about 7 × 3 mm. Upper mesocarp densely fibrous and slightly medullose, solid; lower mesocarp densely fibrous.

In the protolog of this species it was remarked that it probably belonged to Sect. *Mammillarisia.* However, as the fruiting specimen proves, this is not quite correct, for the predominantly unilocular drupes serve to

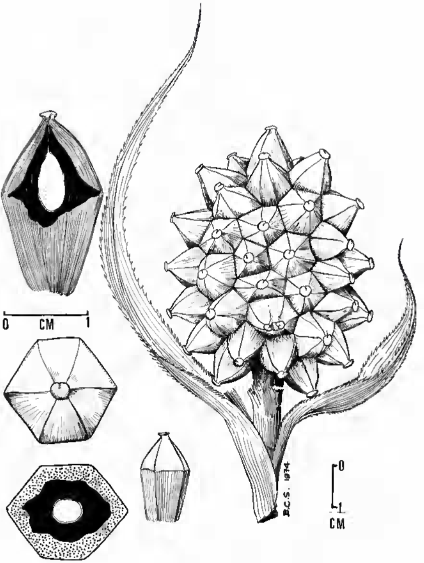

Fig. 1. — **Pandanus pristis** B. C. Stone (*Cremers 2467*).

allocate *P. pristis* to Sect. *Souleyetia* subsect. *Sussea.* The most similar species, as far as drupe form and size is concerned, is *P. dyckioides* Bak., which however has very much more slender leaves, among other differences.

Cremers' field notes are as follows (translated): " Trunk slender, monopodial, branching rhythmically, gradually becoming decumbent then horizontal about 1-2 m long (high) and borne up on many stilt roots. Secondary branches slender, also branching rhythmically, and developing stilt roots. Leaves short, dark green above, whitish near the clasping base, clear green beneath ".

In habit the plants match those of the type, and were collected in the same general region (extreme northern Madagascar on limestone).

The collection is important and completes our knowledge of both sexes of this species. Still lacking are color notes on the ripe fruits.

Sect. *MAMMILLARISIA* St. John

Pandanus aridus St. John

NORTH-EAST: Anivorano N., Forest of Analamera, 14.8.1973, *Cremers 2457* ♀.

Pandanus connatus St. John

NORTH: North face of Montagne d'Ambre, 1 600 m, 22.8.1973, *Cremers 2583* ♀.

Pandanus diffusus Martelli

NORTH-EAST: Marojejy Nature Reserve, 600 m alt., riverine forest, 12.12.72, *Guillaumet 4216*.

Pandanus saxatilis Martelli cfr.

WEST: Between Morondava and Belo sur Tsiribihina, in dry dense forest, tree 3-4 m tall, verticillately branched. 3.12.70, *Guillaumet 3616* (fr.).

NORTH : Montagne des Français, S of Diego-Suarez, 24.8.1973, *Cremers 2642* ♀.

Pandanus stellatus Martelli

NORTH: Forest of Sahafary, 10 km E of Sadjoavato, S of Diego-Suarez, 23.8.1973, *Cremers 2620* ♀.

Pandanus pervilleanus Solms

EAST: Between Foulpointe and Fenerive, 15.10.71, *Cremers 1930* ♀; between Foulpointe and Andondabe, 2.7.1972, *Cremers 2243;* Roadside 15 km S. of Kahanoro, 2.7.1972, *Cremers 2245* ♀; Roadside N. of Mananjary, 14.7.1972, *Cremers 2248* ♀.

Pandanus vandamii Martelli

NORTH-WEST: Border of marsh N of Maromandia, 13.8.1973, *Cremers 2446* ♀; N Ankarana, toward Mahory Forest S of Diego Suarez, 14.8.1973, *Cremers 2466* ♀; c.a. 20 km N of Maromandia, 31.8.1973, *Cremers 2712* ♀.

Pandanus grallatus B.C. Stone, *sp. nov.* (Sect. *Mammillarisia* St. John) (Fig. 2)

Arbor parva subpyramdalis usque ad 5 m alta, trunco erecto monopodiale ramis adscendentibus vel subhorizontalibus radicibus numerosis gralliformibus emittentibus.

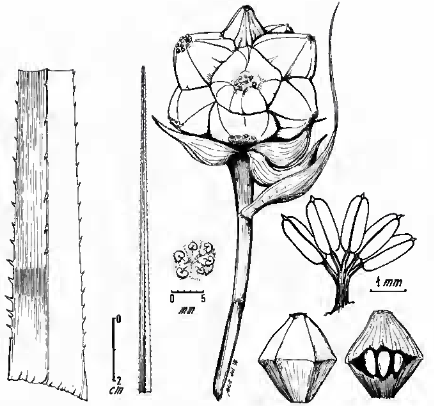

Fig. 2. — **Pandanus grallatus** B. C. Stone (*Cremers 2699*).

Folia parva linearia loriformia c. 50-70 cm longa et 2 cm lata apice anguste flagellata, marginibus in basi dentato-spinulosis, spinulis omnibus antrorsis c. 2 mm longis, 1-9 mm sese separatis; in medio, spinulis valde parvioribus vix 1 mm longis, 3-8 mm sese separatis; in apice spinulis minimis 0.2-0.3 mm longis, 1-3 mm sese separatis, distaliter fuscescentibus; costa media dorso armatis in basi spinulis reflexis subhamatis ad 2 mm longis, 6-15 mm sese separatis; in medio, spinulis antrorsis 1 mm longis, c. 12 mm sese separatis; in apice, spinulis parvioribus congestioribus 0.2-0.3 mm longis, 1-3 mm sese separatis; venis longitudinalibus c. 40-44. Inflorescentia fœminea tantum nota terminalis solitaria, pedunculo c. 10 × 0.6-0.8 cm, trigonali, bracteis infra capitulo ovato cuspidatis, parte basilare naviculare c. 25 × 15 mm, marginibus costaque serrulatis. Cephalium parvum subglobosum 48 mm longum, 55 mm latum e 12 phalangibus formatum, phalangibus 4-11-carpidiatis rhombiformatis (bipyramidalibus) 5-6-angulatis, 23-27 mm longis, 20-26 mm latis, stigmatibus (4-) 6-9 (-11) reniformibus vel hippacrepiformibus, 1-1.5 mm latis longisque planis vel paullo obliquis ad vertex phalangium confertis, inter se vix sulcatis. Endocarpium centralium osseum loculis c. 7 × 4 mm. Mesocarpium apicalium fibroso-medullosum basalium fibrosum.

Typus : Madagascar : 10 km E. of Ambilobe « en petite population sur rocher..., très nombreuses racines échasses », 29.8.1973, *G. Cremers 2699* (holo-, KLU).

This distinctive new species clearly falls into the group of species in Sect. *Mammillarisia* characterized by slender leaves and small solitary cephalia, such as *P. dyckioides*, *P. stellatus*, etc.

It is possible that this is the species figured by GAUDICHAUD under the (invalid) name *Vinsonia elegans*.

Sect. *STEPHANOSTIGMA* Pic.-Ser.

Pandanus analamazaotrensis Martelli

CENTER-EAST: Near Perinet, Analamazaotra, July 1972, *A. Peyrieras s.n.* (fr.).

Pandanus bipyramidatus Martelli cfr.

NORTH-EAST: Marojejy Nature Reserve, 600 m alt., 12.12.1972, *Guillaumet 4212* (fr.).

In the original description of this species it is not stated that the pistillate inflorescence is polycephalic, but in the specimen cited here this is the case. It may be assumed that this is the normal state.

Subgenus MARTELLIDENDRON (Pic.-Ser.) B. C. Stone

Sect. *MARTELLIDENDRON* Pic.-Ser.

Pandanus androcephalanthos Martelli cfr.

NORTH-EAST: Marojejy Nature Reserve, 600 m alt., riverine forest, 12.12.72, *Guillaumet 4213* (fr.).

EAST: Beforona, Perinet, 900 m alt., July 1972, *A. Peyrieras s.n.* (fr.).

It remains virtually impossible to discriminate species readily in this section since two species are known from fruits, one from staminate flowers only, and only one of the former two from both fruits and staminate flowers. It seems quite possible that only a single species is really involved.

SECTION UNKNOWN

Pandanus flagellaris B.C. Stone, *sp. nov.* (Fig. 3)

Frutex arboriformis subpyramidalis usque ad 2.5 m alta, trunco monopodiale basi radicibus æreis paucis brevibus conam formantibus instructo radicibus subterraneis subtuberosis, ramis ramulisque adscendentibus, ramulis foliosis, c. 3 cm diametro.

Folia anguste lineari-lanceolata in flagello perelongato apice angustissimo flagellariforme extensa, c. 160-170 cm longa, 10-13 mm lata, costa media dorso in basi usque ad 2/3 longitudinis læve inermi, in tertia parte apicali antrorse denticulatis dentibus ad eos marginum adjacentium simillimis; marginibus per totam longitudinem folii dentatis vel denticulatis, in basi cum dentibus subdeltoideis 1-2 (-2.5) mm longis plerumque 4-14 mm

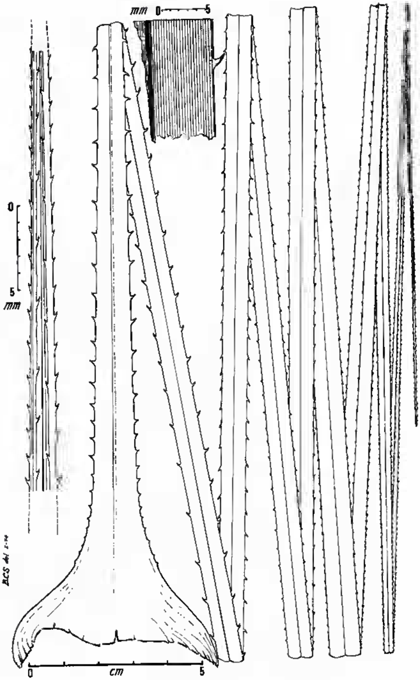
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Fig. 3. — **Pandanus flagellaris** B. C. Stone (*Cremers 2497*).

Source : MNHN, Paris

sese separatis rectiformibus vel paullo antrorsis, postea leviter vel insigniter recurvatis vel retrorsis; in medio dentibus gradatim parvioribus 1-0.5 mm longis plerumque 4-8 mm sese separatis angustioribus primo leviter retrorsis, pastea leviter tum crescentiter antrorsis; in apice, denticulis mox parvissimis 0.33-0.2 mm longis, 2-1 mm sese separatis; plicis binis apicis adaxialibus per spatiam brevem (2-3 cm) penultimam denticulatis dentibus antrorsis inflexis ad eos marginum adjacentium simillimis, 2-4 mm sese separatis; apice ultimo flagelliformi triquetro pagina adaxiale læve plana; venis longitudinalibus c. 38-42, infra minute prominulentis, supra plusminusve inconspicuis; parte basilari folii dorsaliter læve; pagina dorsali glauco. Flos et fructu ignoti.

TYPUS : Madagascar: Forest of Analamera, E. Anivorano Nord, 16.8.1973, *G. Cremers 2497* (holo-, KLU).

A striking species; the long slender very slenderly flagellate leaves with the unusual character of mostly retrorse marginal prickles along at least the basal third, and the extremely minute prickles along the apical ventral pleats, coupled with the rounded midrib unarmed except along the apical third of the leaf, afford strong identifying features even in the absence of flowers or fruits.

Although this species cannot be placed, for the moment, in a Section of the genus, it is almost certain that it pertains to subgenus *Vinsonia.*

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